

We claim

1. An all optical wireless communication system including: A transmitter that receives wavelength λ_1 and down converts it to wavelength $\lambda_2 > \lambda_1$ for transmission through the atmosphere. A receiver where the radiation λ_2 is up converted back to wavelength λ_1 . The transmitter and receiver include a non-linear crystal, a laser pump and collimating optics.
2. A system like in claim 1 where the non-linear elements are formed from quasi-phase matched crystals sintered together.
3. A system like in claim 1 that includes both transmitter and receiver elements in each side of the transmission range.
4. A system like in claim 1 where same crystal, same pump laser or same optics are used for the up and down conversion functions.
5. A system like in claim 1 where λ_1 is in the near infrared and λ_2 is in the mid Infrared. wavelength.
6. A system like in claim 1 where λ_1 is in the near infrared and λ_2 is in the THz wavelength atmospheric channel.
7. A system like in claim 1 where the down conversion is performed by the difference frequency generation and the up conversion is performed by the sum frequency generation.
8. A system like in claim 1 but with output wavelength λ_2 not equal to λ_1 , but shifted to a different wavelength.

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- 1) D. Zheng, L.A.Gordon, Y.S.Wu,R.S.Feigelson, M.M.Fejer, R.L.Byer, K.L.Vodopyanov.16 micron infrared generation by difference frequency mixing in diffusion bonded stacked GaAs,Opt.Lett.Vol.23, p.1010-1012 (1998)
- 2) Yoo. S.J.B. Polarization independent multi-channel wavelength conversion by difference frequency generation in AlGaAs waveguides, Proc. SPIE Vol. 3491. p. 39-44, (1998)).